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Double Shock Initiation of the Explosive EDC-37

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Double Shock Initiation of the Explosive EDC-37

Experiments Measure Buildup to Detonation (Initiation) Resulting from a Double Shock Wave in the Explosive. Buildup is Measured Using Embedded Electromagnetic Particle Velocity Gauges

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Introduction: Why do Double Shock Experiments in EDC-37?

Obtain Better Data on Double Shock Initiation

- CLEAN Particle velocity wave profiles at 10 - 12 positions
- Position -time (x-t) shock trajectories

Test “Rules of Thumb” for Double Shocks

- Buildup only begins after the two waves coalesce
- The single shock “Pop – Plot” will predict the run to detonation.

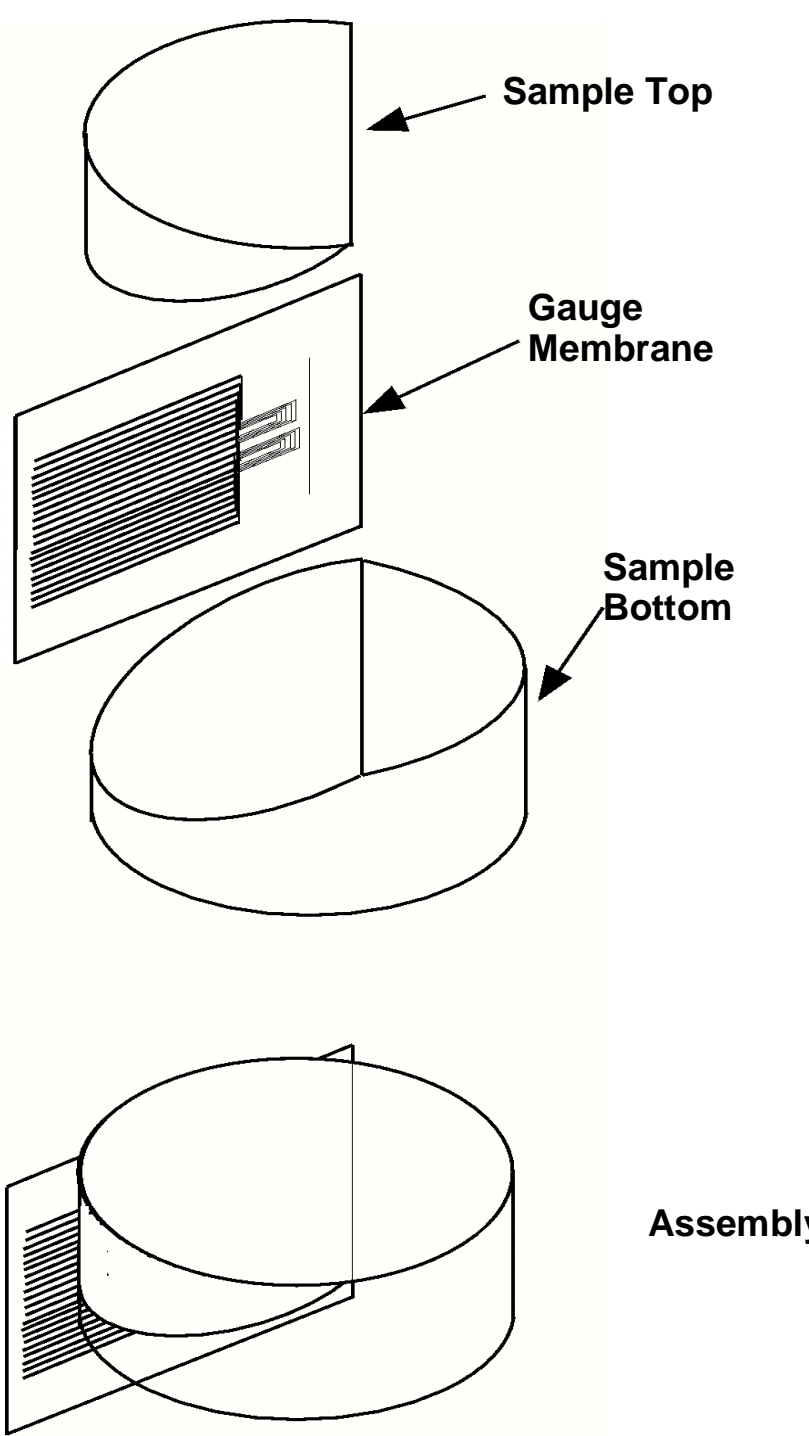
Data Tests Reactive Burn Numerical Models

What is EDC-37?

- 90% HMX
- Liquid Binder
- Mostly Fine (< 40mm) Particles
- Very Low Void Content (< 0.3%)
- Least Sensitive HMX based Explosive

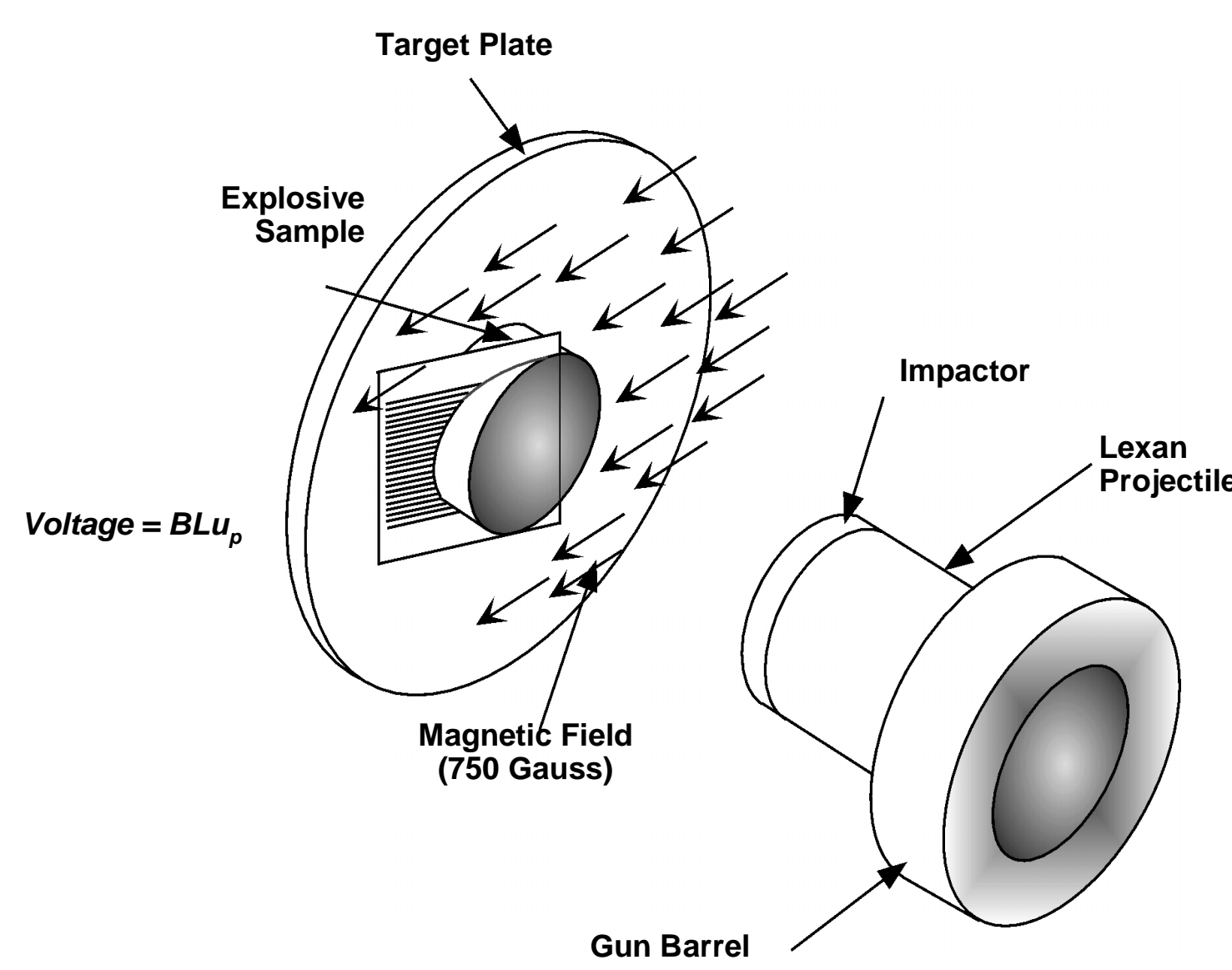
General Experimental Setup

Explosive Target Assembly

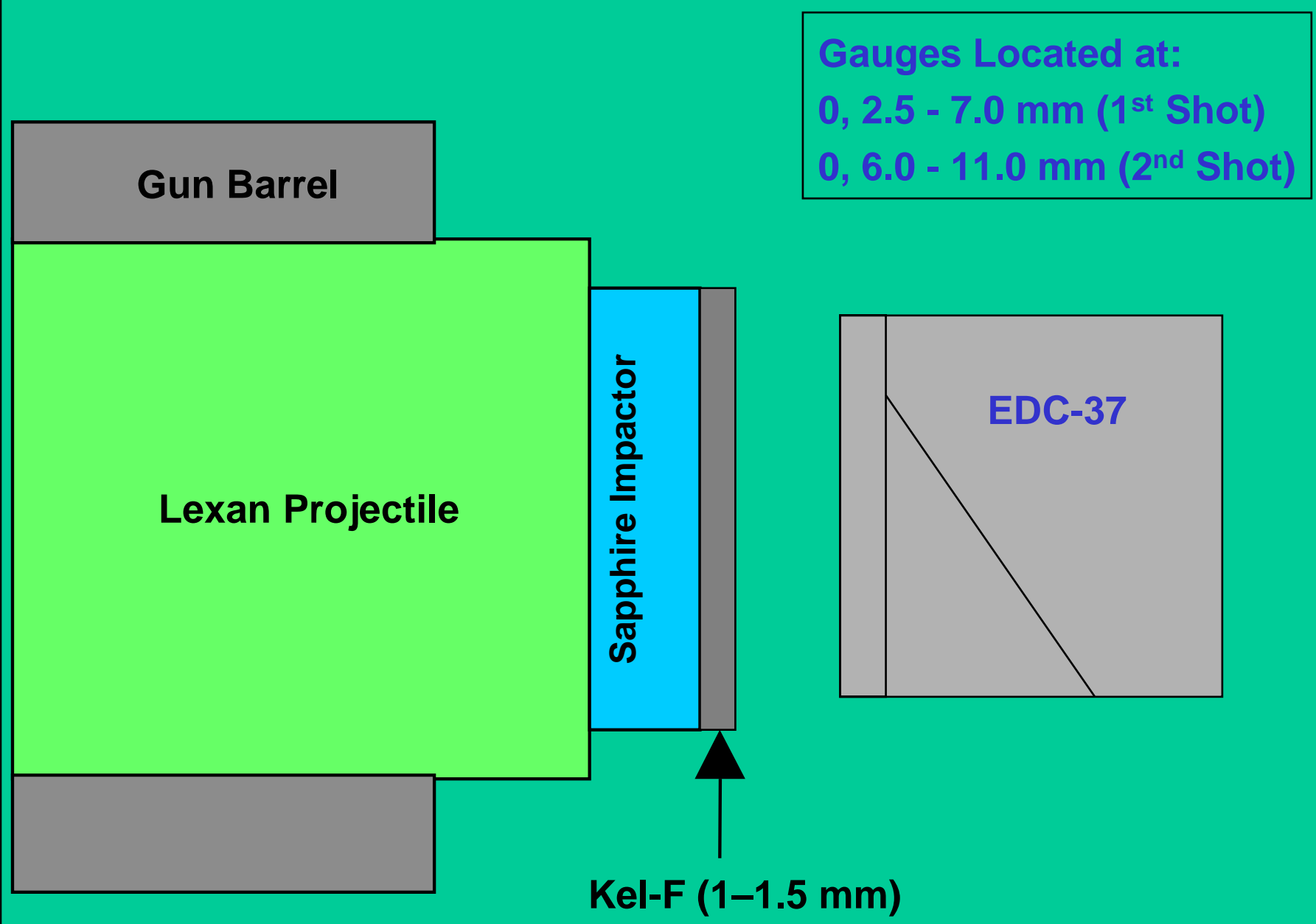


50 mm Dia. X 25 - 31 mm thick

Target in Gun



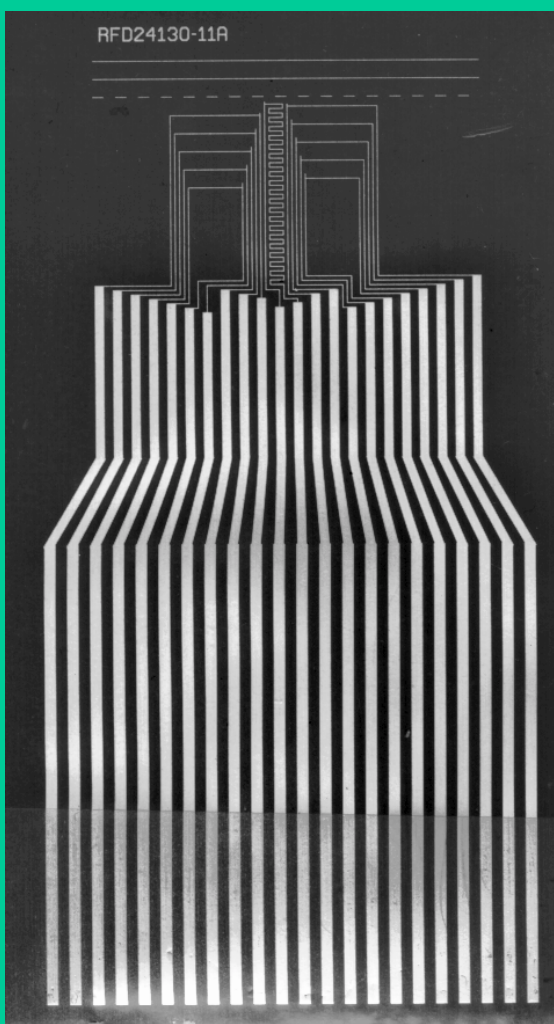
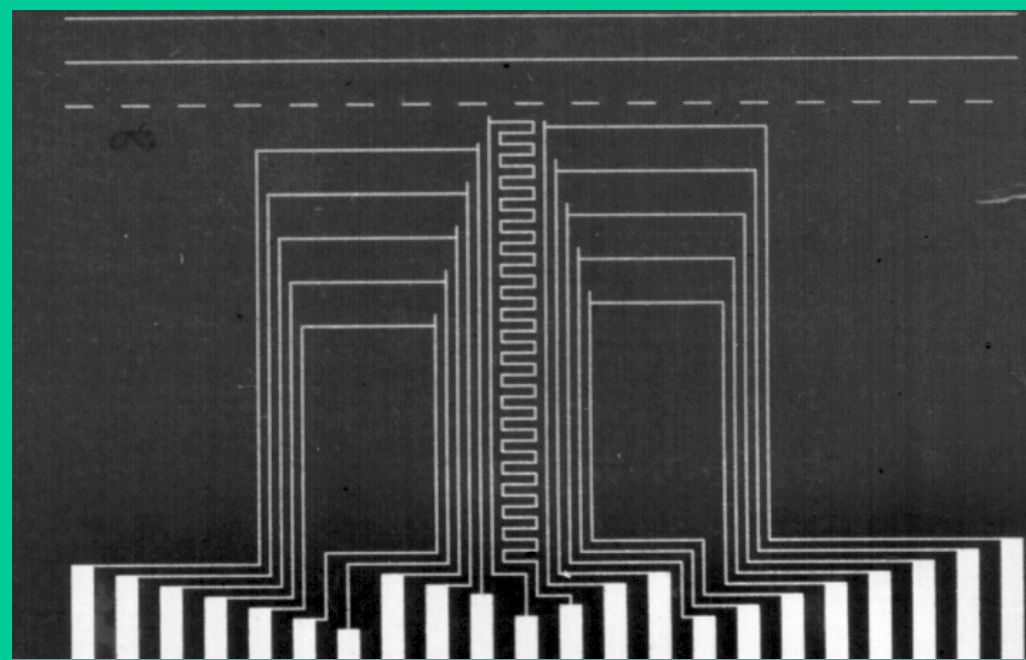
Modification of Experiment for Double Shocks



- Kel-F launches weak wave into EDC-37
- Sapphire launches stronger, overtaking wave
- 6 mm cap may be used on front of explosive to place gauges at desired depth

Magnetic Gauge Details Multiple Magnetic Gauge

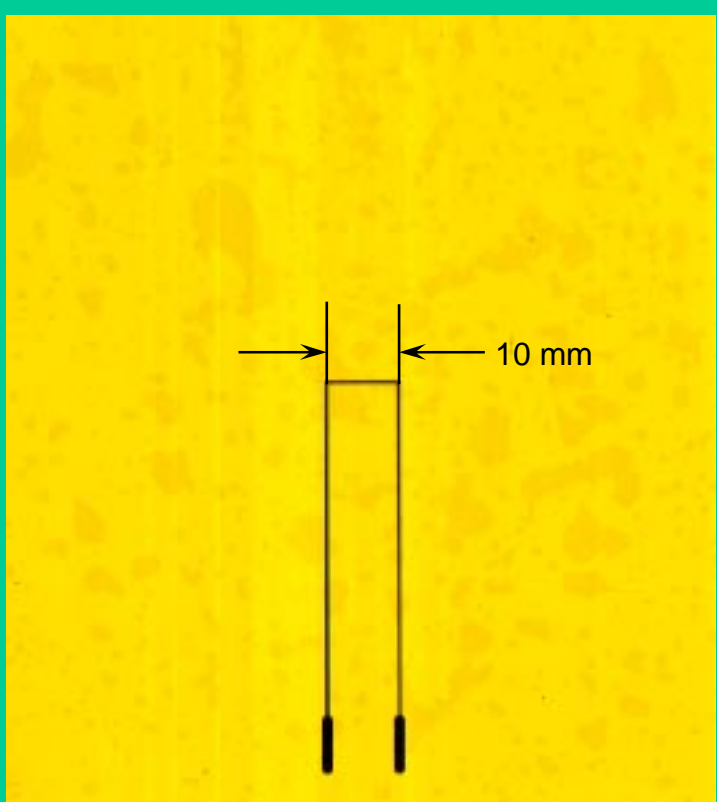
- Ten Particle Velocity Gauges
- Shock Tracker



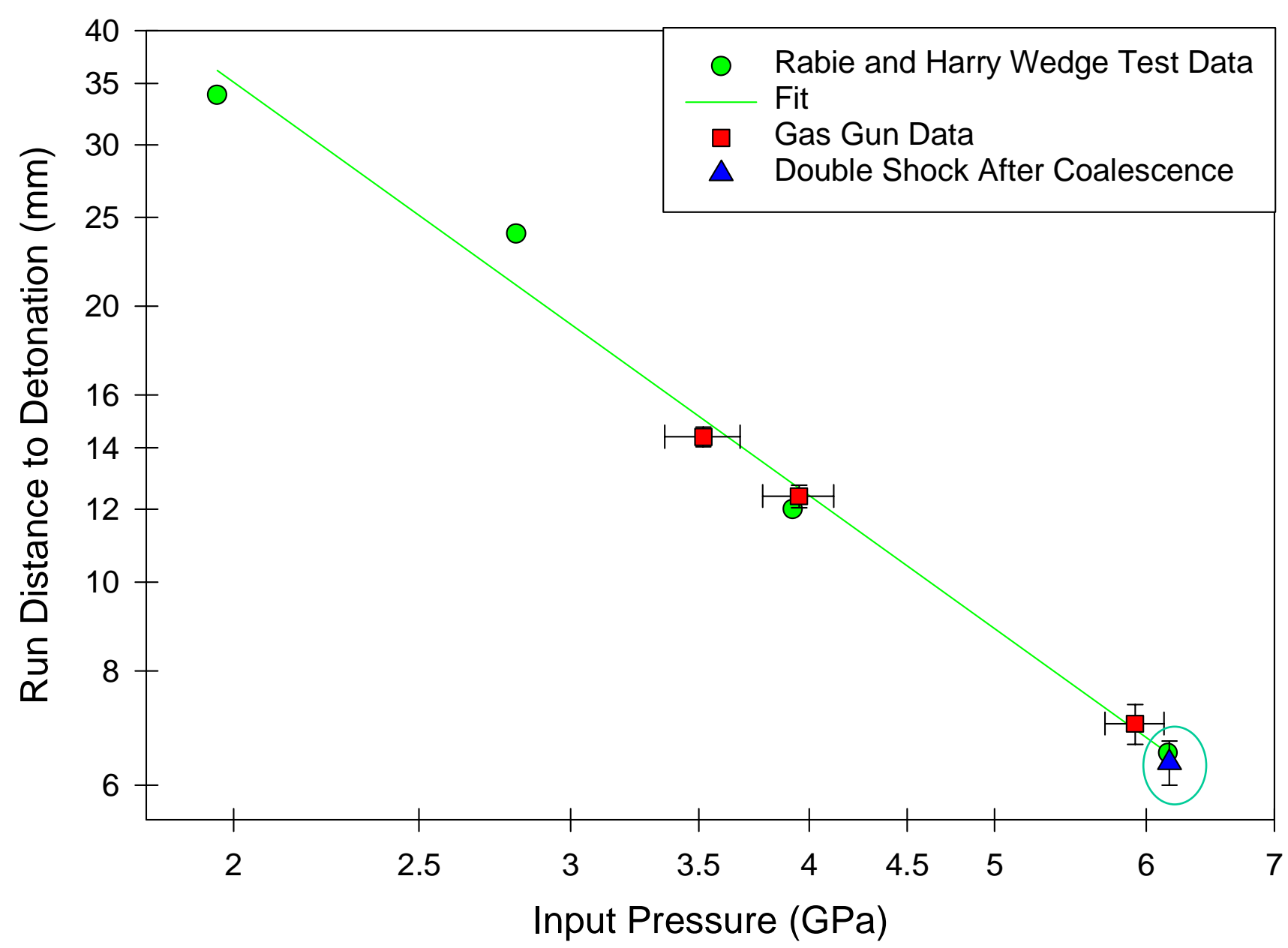
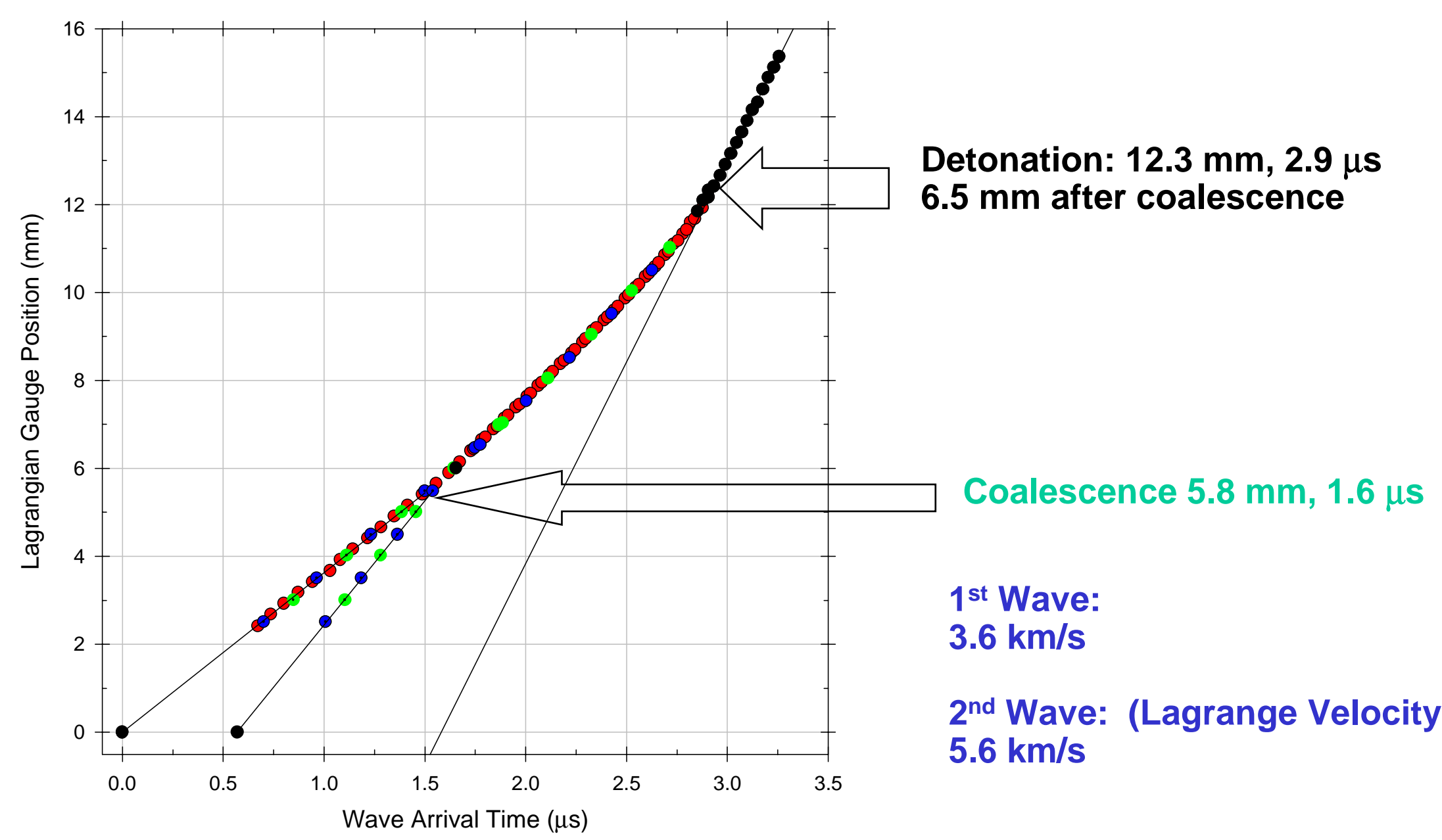
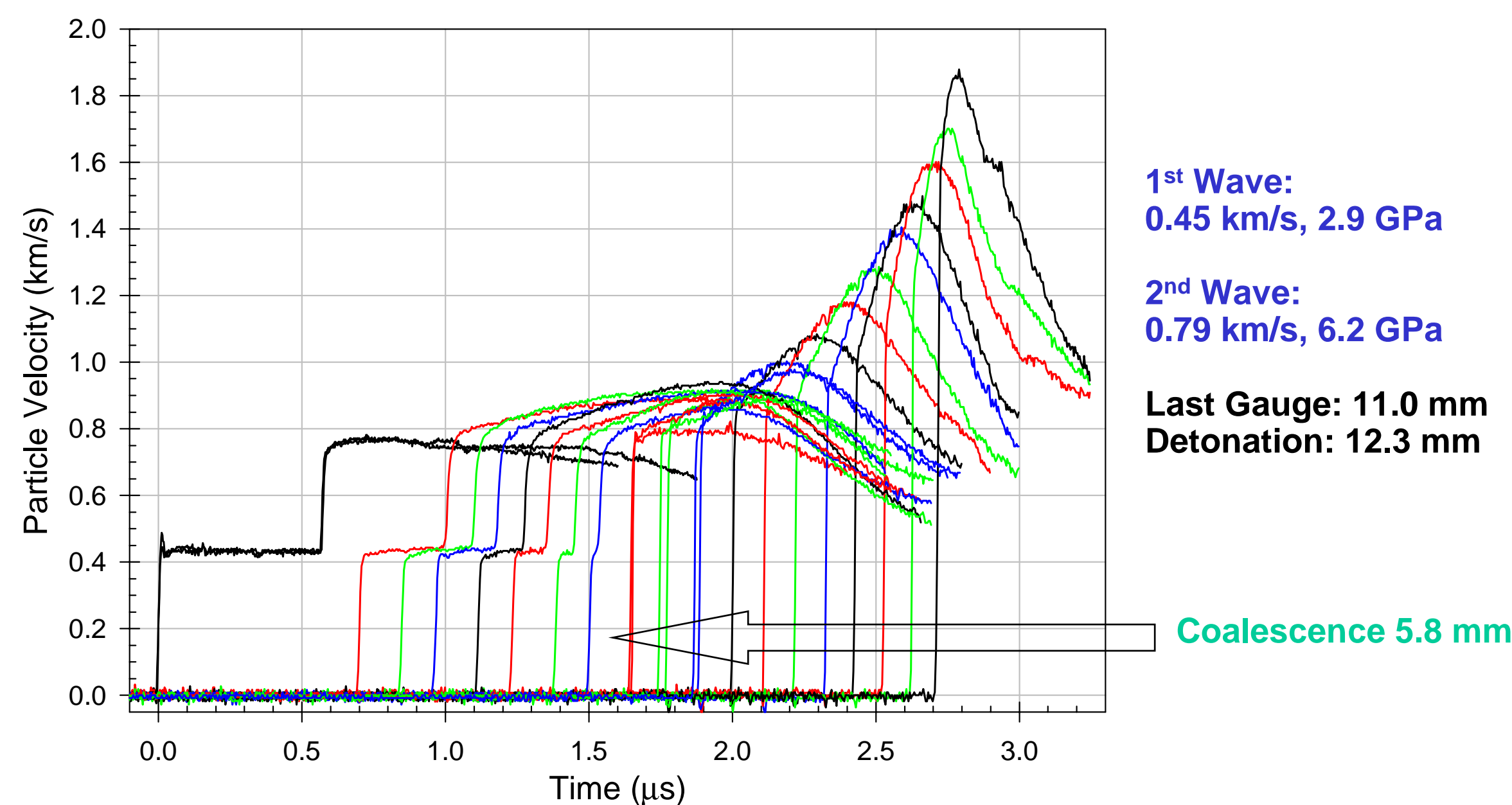
Stirrup Gauge

- Gauges Mounted on:
 - Impact Surface
 - Other depth as needed
- Aluminum Element
 - 5 μ m thick
 - Active End 10 mm
- FEP Teflon Backing
 - 13 μ m thick

Voltage - BLu_p

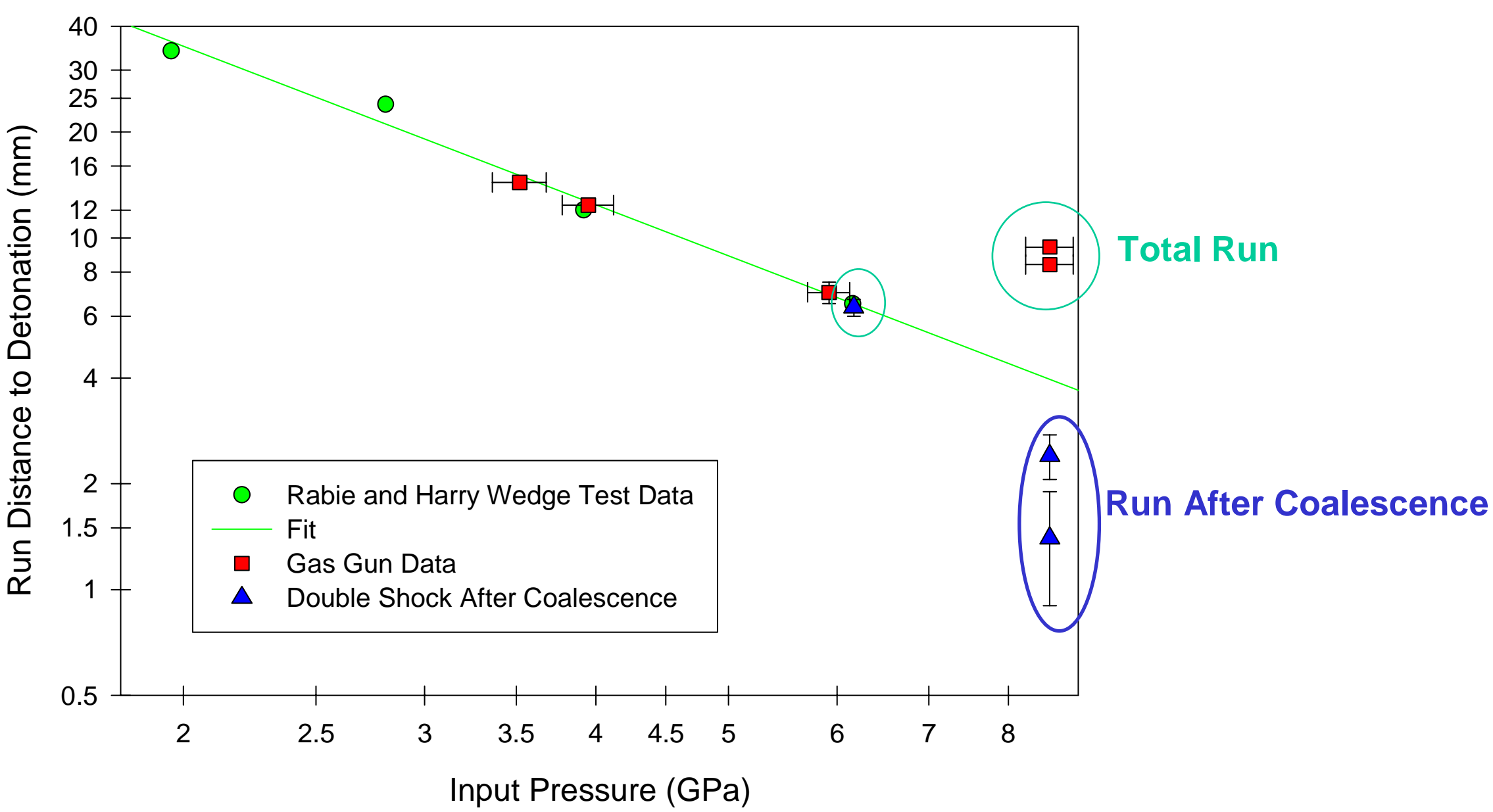
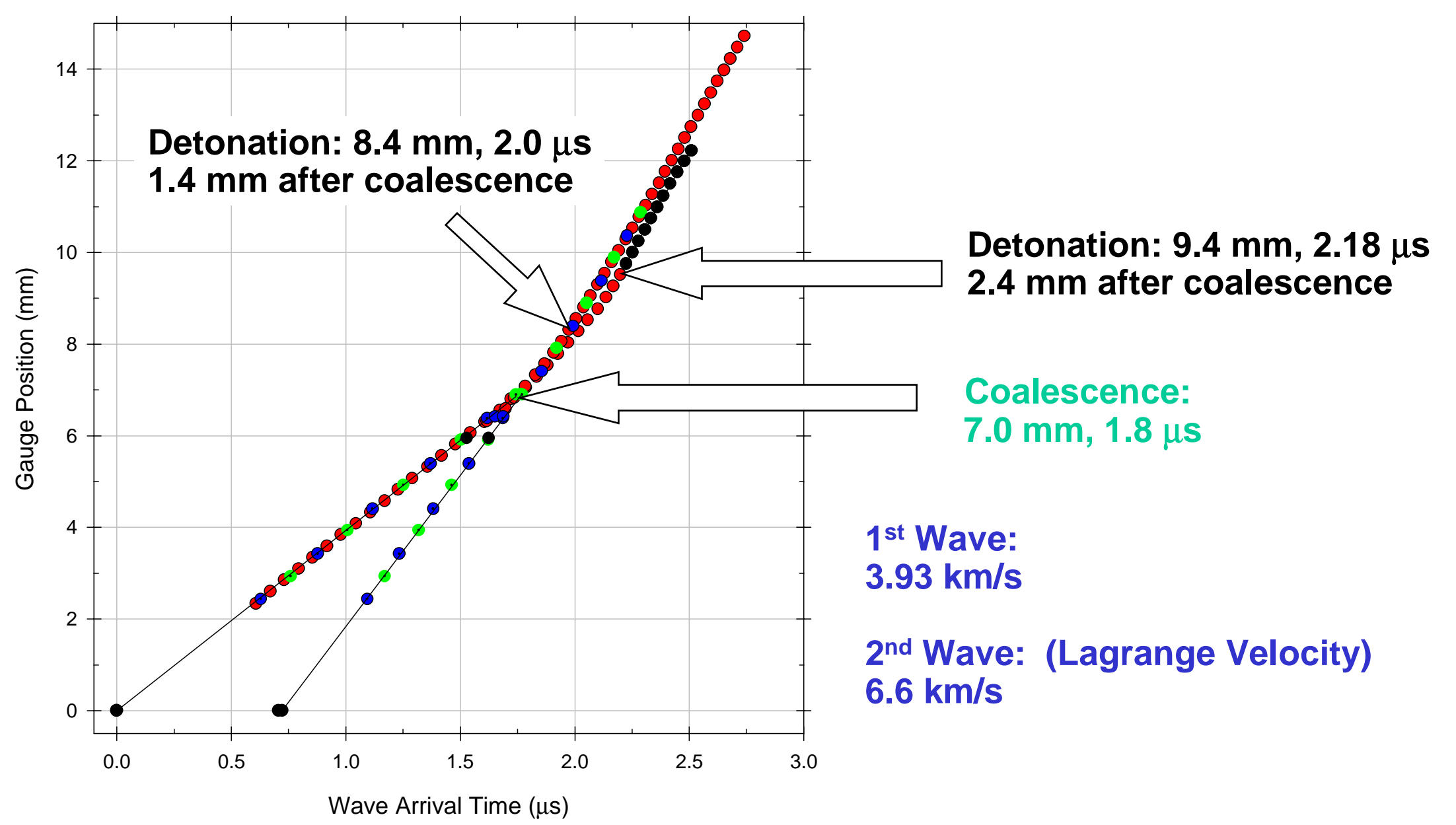
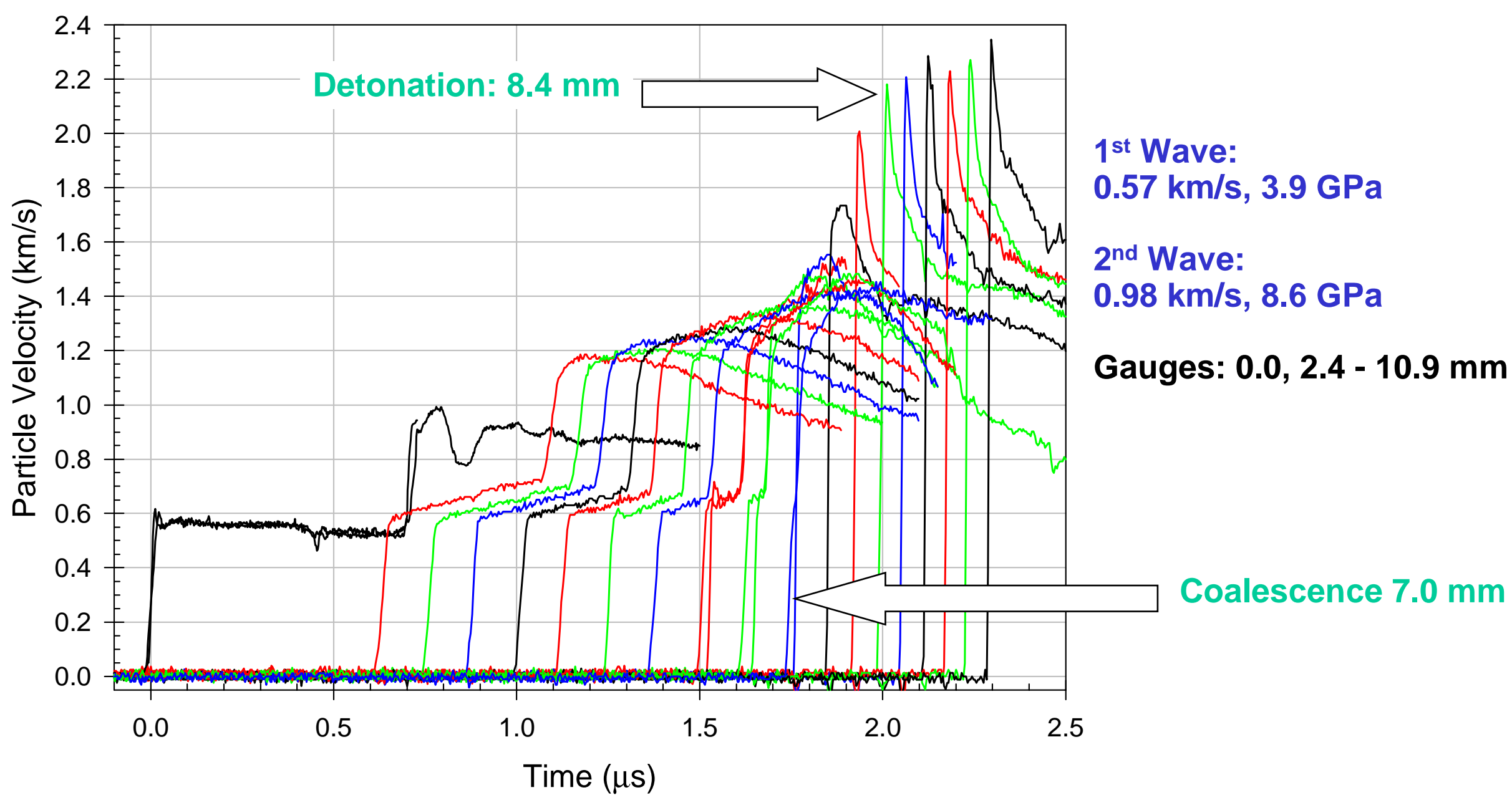


Non – Reactive First Shock Shots 1&2 Combined: 2.9 / 6.2 GPa Input



- Buildup commences after the two waves coalesce.
- The single shock Pop – plot predicts the run to detonation.

Reactive First Shock •Shots 3&4 Combined: 3.9 / 8.6 GPa Input •Longer Pulse Length



- Reaction before coalescence contributes to final buildup.
- The single shock Pop – plot does not predict the run to detonation.